

The Recent Spondylidae of South Africa and Mozambique,
with the description of a new species
(Mollusca, Bivalvia, Pectinoidea)

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Ten species of the genus *Spondylus* are recorded from South Africa and Mozambique (6 from South Africa, 9 from Mozambique). Of these, only *Spondylus nicobaricus* Schreibers, 1793, has been reported previously. *Spondylus groschi* from Mozambique and Natal is described as new. The remainder are widely distributed Indo-Pacific taxa: *Spondylus cuneus* Reeve, 1856, *Spondylus sinensis* Schreibers, 1793, *Spondylus occidens* Sowerby, 1903, *Spondylus sanguineus* Dunker, 1852, *Spondylus castus* Reeve, 1856, *Spondylus butleri* Reeve, 1856, *Spondylus flabellum* Reeve, 1856, and *Spondylus tenuispinosus* Sowerby, 1847.

Key words: Mollusca, Bivalvia, Spondylidae, *Spondylus*, new species, South Africa, Mozambique

Introduction

Published records of the family Spondylidae from South Africa and Mozambique are sparsely scattered through the literature. The first South African record of the genus *Spondylus* dates from Sowerby (1897: 28) who recorded *Spondylus nicobaricus* ("Chemnitz") Schreibers, 1793, and *S. ducalis* ("Chemnitz") Röding, 1798, from Natal. The latter record has never been confirmed, and is presumed to be erroneous. Barnard (1964) accepted the occurrence of only *S. nicobaricus* (as *Spondylus hystrix* Röding, 1798).

The first records of *Spondylus* from Mozambique were published by Braga (1952), who recorded *S. nicobaricus* and also *S. microlepos* Lamarck, 1819; Paes da Franca (1960) reported the same two species. Boshoff (1965) regarded Mozambican records of *microlepos* as being based on *S. regius* (Linnaeus, 1758). However, no trace of that distinctive species has been reported from the south-western Indian Ocean, and the material in question was probably *S. sinensis* Schreibers, 1793. (The primary collection of Inhaca bivalves on which Boshoff based this record was destined for the Estação de

Biologia Maritima de Inhaca, but cannot now be located; his duplicate collection, deposited in the Natal Museum, contains only *S. nicobaricus*.)

Although not concerning the Recent fauna, it may also be mentioned that Barnard (1964: 436, fig. 15) recorded a broken valve from limestone deposits at Klein River (southern Cape Province, Overberg area) as "*Spondylus* sp." The material is probably referable to *Hinnites ercolianus* (Cocconi, 1873), a West African species of the family Pectinidae whose present range appears to extend to northern Namibia.

This is the first study of the spondylid material from South Africa and Mozambique housed in the Natal Museum. Examination of this material has revealed the presence of one previously undescribed species of *Spondylus* from the region and eight previously unrecorded species.

Abbreviations: KL, Lamprell collection; lv, left valve (upper or top valve); leg, collector; LT, Low Tide; LST, Low Spring Tide; NM, Natal Museum; NMDP, Natal Museum dredging programme; NPB, Natal Parks Board; ORI, Oceanographic Research Institute; pv, paired valves; QM, Queensland Museum; rv, right valve (lower valve).

Systematics

Family Spondylidae Gray, 1826

Spondylus Linnaeus, 1758 Type species *Spondylus gaederopus* Linnaeus, 1758.

Key to *Spondylus* in South Africa and Mozambique

1. Radial ribs with spines very short or absent, outline fan-shaped 2
 Radial ribs with well developed spines; outline rarely fan shaped 3
2. Radial ribs uniform in strength; cardinal area with 2 or more brown stripes diverging from umbones; shell small, to 50mm in height *S. sanguineus*
 Radial ribs very uneven in strength, cardinal area without stripes; shell large, to 110mm in height *S. flabellum*
3. Upper (left) valve with 5–7 principal ribs and spatulate spines 4
 Upper (left) valve with numerous rows of ribs and dense spines 5
4. Upper valve with 6–7 principal ribs with numerous, overlapping, spatulate spines
 *S. groschi*
 Upper valve with 5–6 principal ribs with sparse, spatulate and/or pointed spines .
 *S. sinensis*
5. Spines non-spatulate 6
 Spines sharp to blunt, erect 7
6. Spines curved, not depressed; shell colour black-brown, spines purple, yellow or orange; shell large, to 80mm in height *S. butleri*
 Spines straight, depressed; shell colour white with black spotting extending into rib intervals; shell medium, to 50mm in height *S. castus*

7. Spines blunt, rarely erect; short to long 8
 Spines sharp, erect, short 9
8. Spines denser and overlapping each other marginally; interstitial areas smooth; purple-brown *S. cuneus*
 Spines spatulate marginally; interstitial areas with dense sharp upright spines and striae; rose coloured *S. tenuispinosus*
9. Interstices with radial striae and minute spines; umbonal region white with regular rows of dark spots *S. nicobaricus*
 Interstices smooth; umbonal region not dark spotted *S. occidentis*

Spondylus groschi sp.nov.

Figure 1A-C

Diagnosis: Shell ovate, thick. Hinge typical for genus. Top (left) valve moderately and evenly convex; interior slightly excavated under hinge plate, with a strong, coloured crenulated margin; auricles moderately wide, umbonal margins denticulate. Sculpture consisting of 6-7 well-defined, principal radial ribs, bearing strong, depressed, overlapping, spatulate spines which are hollowed on their underside, only slightly narrower at their base, moderately concave at their termination, almost obsolete umbonally; young specimens often develop palmate ends to spatulate spines near lower margin. Each rib interval usually with one secondary radial rib ornamented with sharp or slightly flattened, overlapping spines, the remaining interstitial surface covered with dense radial striae and fine, fairly sharp spines, varying in length; however (rarely) in some young specimens the interstitial ornamentation is of equal strength to the principal ribs. Lower (right) valve more convex than top valve, some senile specimens much more convex than younger specimens; cardinal area triangular and shallow; internally with moderate, shallow excavation under hinge plate and a strong, coloured, crenulated margin. Fixation area small, sometimes with a variable amount of thin concentric foliations umbonally; sculpture on non-attached part similar to that of top valve. Colour mauve-brown with white at base of spines, or orange, orange red or deep brick-red, main spines sometimes contrastingly yellowish or lilac-coloured; umbonal region often with irregular brown spots, blotches or undulating marks; internally white, with the margins coloured the same as the external surface.

Type locality: SE Conducia Bay, Mozambique.

Material examined: Holotype: 1pv, NM-H164/T1000, SE Conducia Bay, north of Inhaca, Mozambique Province, E side of reef, edge of rock, current, LST, K. Grosch, Nov 1967.

Paratypes: Northern Mozambique: 1pv, NM-H161/T1001, Mozambique Island, south shore, on outer edge, rocky ledge above coral area, LST, K. Grosch, Nov 1958; 1pv, NM-H166/T1002, Conducia Bay, Mozambique Province, K. Grosch, Nov 1975; 1pv, QM MO52425, south east Memba Bay, south west of Ponta Nangata, Mozambique Province, on rock near coral area, some surf, LST, K. Grosch, Nov 1975; 1pv, NM-H159/T1003, SW Conducia Bay, north of Chocas, Mozambique Province, washed up

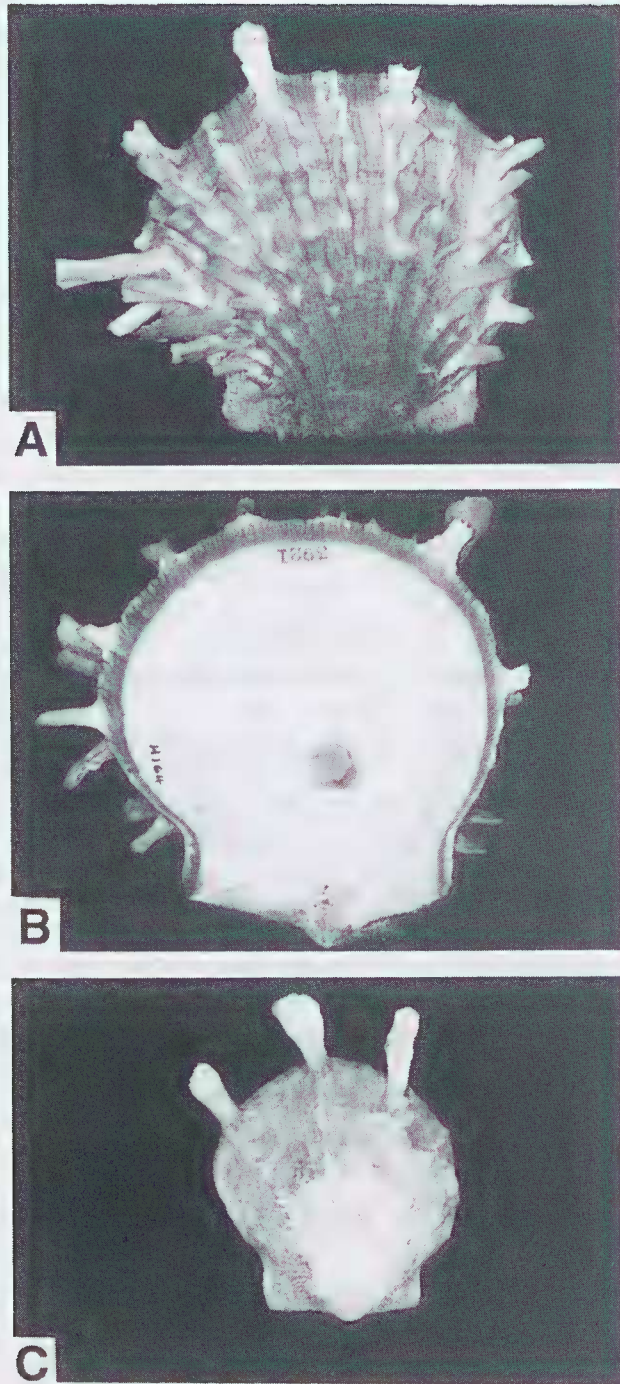


Fig 1. *Spondylus groschi* n. sp. A-B, Holotype, NM-H161, Conducia Bay, Mozambique, height 77.5 mm, length 77.4 mm; C. NM-E3651, off Gypsy Hill, Zululand, 65-70 m, height 12.3 mm, length 11.6 mm, juv. Measurements exclude spines.

during cyclone, K. Grosch, Dec 1951; 1pv, NM-H167/T1004, SE Lunga Bay, Mozambique Province, on rock near coral reef, current, some surf, LST, K. Grosch, Sept 1975; 1pv, NM-H163/T1005, Conducia Bay, Mozambique Province, K. Grosch, Sept 1975.

Other material: Northern Mozambique: 1pv, NM-H168, SW Conducia Bay, W of Is. Inhaca Grande, on underside of rock slab in tidal pool, LST, K. Grosch, Oct 1968; 1pv, NM-H171, SW Conducia Bay, NW of Chocas, on edge of rocky shelf, no surf, 0.7 m below LST, K. Grosch, Apr 1961; 1pv, NM-H172, SE Conducia Bay, W. coast of Is. Inhaca Grande, on encrusted rock in tidal pool, LST, K. Grosch, Oct 1968; 1pv, NM-H170, SW Conducia Bay, N of Chocas, washed up during cyclone, K. Grosch, Apr 1954; 1pv, NM-H169 SW Conducia Bay, NW of Chocas, on rocky reef, 0.7m below LST, K. Grosch, Sept 1962; 1pv, NM-H162, Conducia Bay, K. Grosch; 1pv, NM-H165, SE Nacala Bay, E of Fern Velosa, edge of rock above coral area, some surf, LST level, K. Grosch, Jan 1958; 1pv, NM-H160, SE Memba Bay, SW of Ponta Nangata, on rock near coral area, some surf, LST, K. Grosch, Jun 1960. South Africa: Zululand: 1lv, NM-D5195, Sodwana Bay, Two-Mile Reef, 10–15m, dived, D. Herbert, Oct 1986; 1lv, NM-D5096, Sodwana Bay, Two-Mile Reef, outer edge, 14–17m, dived, D. Herbert, Oct 1986; 2lv, NM-E809, Sodwana Bay, sponge reef, 33m, dived, D. Herbert & NPB, Sept 1987; 1lv, NM-D1846, Sodwana Bay, Two-Mile Reef, 10–15m, dived, D. Herbert, Oct 1985; 1pv, NM-E2472, Leadsman Shoal, Raggie Reef, 1–2km N of Leven Point, 8–12 m, mixed algal and coral reef, dived, D. Herbert & NPB, May 1988; 1lv, NM-E2421, Leadsman Shoal, reef off wreck of Tamavo, 20–28m, D. Herbert & NPB, May 1988; 1lv, NM-S1038, Kosi Bay, main reef, 1–4km S of estuary mouth, 18–20m, dived, D. Herbert & NPB, May 1990; 1lv, NM-4599, Bhanga Nek, c. 15 km S. of Kosi Bay, beach-drift, O. Bourquin, Jan 1965; 1pv, NM-S1785, between Bhanga Nek and Kosi Bay, reef off marker 13 north, 8–14m, D. Herbert & NPB, May 1990; 1lv, NM-D9594, between Bhanga Nek and Kosi Bay, No.13 reef, 6–18m, 12–20 Jul 1987, D. Herbert et al. 1lv, NM-E3651, off Gypsy Hill, Zululand, 65–70 m, NMDP. East Africa: Mombasa, Kenya: 1pv, KL, on reef low tide, 1993.

Measurements of holotype (excluding spines): Height 77.5mm (umbo to margin), length 77.4mm, depth (conjoined valves) 44.5mm.

Measurements of paratypes: NM-H161/T1001, height 58mm (umbo to margin), length 64.4mm, depth (conjoined valves) 35.7mm; NM-H166/T1002, height 43.5mm (umbo to margin), length 45.7mm, depth (conjoined valves) 26.1mm; NM-H159/T1003, height 50.8mm (umbo to margin), length 54mm, depth (conjoined valves) 31.8mm; NM-H167/T1004, height 35.5 mm(umbo to margin), length 34.4mm, depth (conjoined valves) 20.9mm; NM-H163/T1005, height 67.8mm (umbo to margin), length 70mm, depth (conjoined valves) 44.6mm.

Distribution: Zululand (Leadsman Shoal) to Mombasa, Kenya, East Africa.

Habitat: In coral reef areas, attached to rocks or corals, in more tropical areas from low tide (occasionally in pools) to <1m below, further south in about 8–28m depth.

Remarks: The species is generally constant in its sculpture, although paratype NM-H166, which is slightly juvenile, is more densely spined than normal and has more numerous principal ribs, each of which is ornamented with spatulate spines which are

wider at their termination. Some NM lots consist of beach-worn specimens, which have a similar rib count to the holotype, but display variation in shape from ovate or elongate-ovate to moderately fan-shaped.

Comparisons: *Spondylus groschi* resembles a number of species from the central Indo-West Pacific. It is closest in characters to *Spondylus violascens* Lamarck, 1819, which differs in having irregular ornamentation, lack of denticulate umbonal margins and narrower interstices that lack the dense spines of this species. *S. barbatus* Reeve, 1856, differs from *S. groschi* in possessing both sharp and spatulate spines, intermixed, on the principal ribs; of these the spatulate spines are mainly developed at the lower margins, while the interstices have sharp, short, upright spines; in addition, in *S. barbatus* the upper margins have colour bars which form a chevron pattern. *S. groschi* differs from *S. squamosus* Schreibers, 1793, principally in its having constant black and white radial rays, the presence of colour bars at the upper margins and the lack of denticulations to the margins. *S. sinensis* Schreibers, 1793, although similar in shape to *S. groschi*, differs in its greater inflation, longer principal spines, claw-like spatulae, much stronger interstitial ribs and much finer interstitial ornamentation. *S. imbutus* Reeve, 1856 (= *S. nux* Reeve, 1856), from the Philippines, differs from *S. groschi* in having 5 principal ribs which bear sparse, long, strongly incurved, leaf-shaped, fragile spatulae; the interstices bear fine minor ribs with microscopic striae, the auricles are narrow and devoid of denticulations.

Etymology: Named after Kurt Joachim Grosch (1912–1991), veteran Mozambique collector who provided most of the specimens used in this study.

Spondylus butleri Reeve, 1856

Figure 2A

Spondylus butleri Reeve, 1856: pl. 4, sp. 16; Fulton, 1915: 355, sp. 60; Lamprell, 1992: 192. Type locality: Philippine Islands.

Spondylus longitudinalis (non Lamarck,) Lamprell, 1986: 22, pl. 4, fig. 2.

Diagnosis: Shell height (left) valve to 75mm; top valve usually more inflated than the lower. Sculpture of numerous, fine, radial ribs which are ornamented with strong, depressed, sharp or slightly spatulate spines; interstices smooth, without sculpture. Colour variable, interstices dark brown, spines yellow, orange, red or brown; internally blue-white, inner crenulated margin dark-brown, outer margin purple-brown, hinge and margins near umbones light brown.

Material examined: Northern Mozambique: 1pv, NM-H357, SW Conducia Bay, N of Chocas, Mozambique Province, amongst marine growth on coral boulder, 3 m below LST, K. Grosch, Mar 1959; 1pv, NM-H354, Conducia Bay, Choca, coral area, washed up during cyclone, K. Grosch, Jan 1953. South Africa: Zululand: 1lv, NM-D7085, off Dog Point (27°06.6'S, 32°51.9'E), 50m, sandstone conglomerate, marine growths, dredged, NMDP, 4 Jun 1987; 2lv, 2rv, NM-D8811, off Dog Point (27°06.6'S, 32°51.9'E), 50m, sandstone conglomerate, marine growths, dredged, NMDP, 4 Jun 1987.

Distribution: Indo-Pacific to northern Zululand.

Habitat: On coral among marine growths to 3 metres.

Spondylus sinensis Schreibers, 1793

Figure 2B

Spondylus sinensis Schreibers, 1793: 154 (based on Chemnitz, 1784: 75, pl. 44, figs 461–462); Cox, 1928: 252; Lamy, 1938: 293 (references, synonymy); Lamprell, 1986:

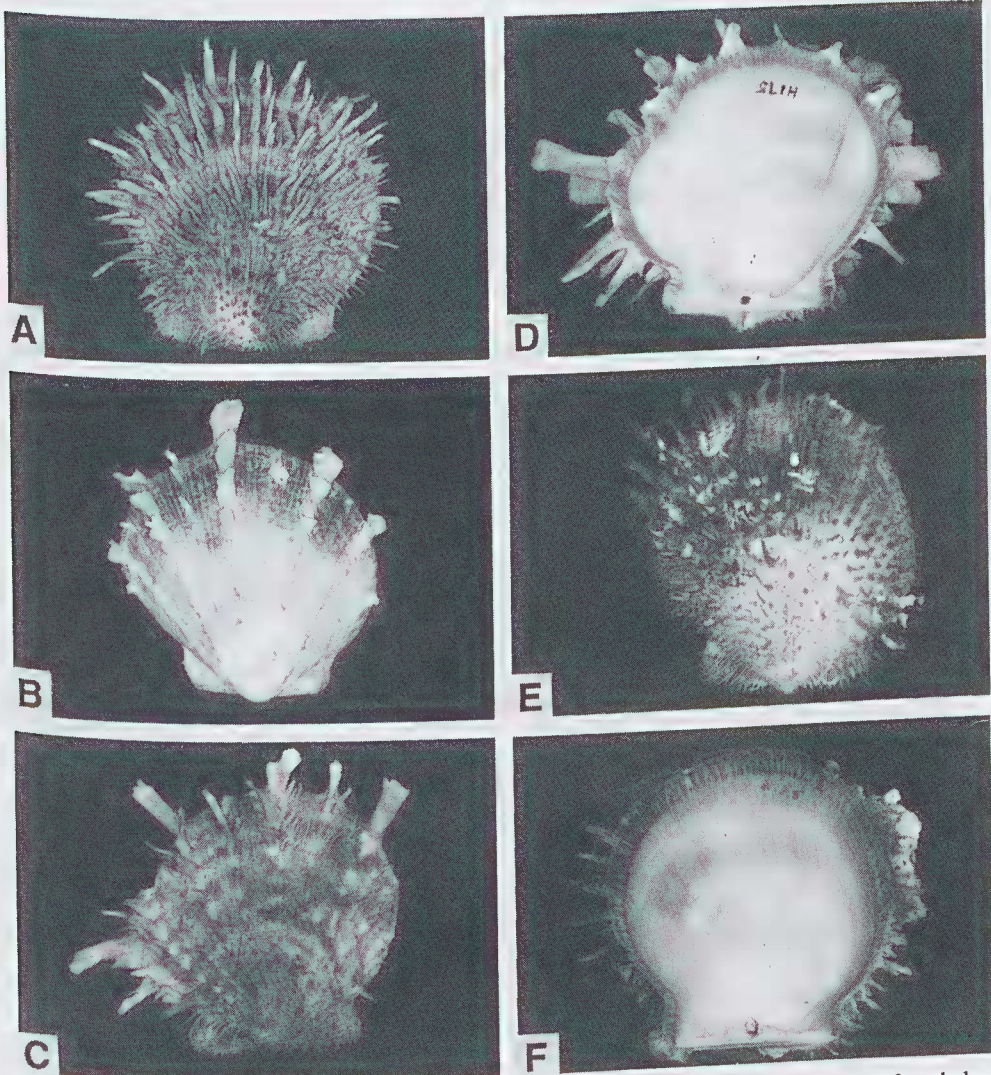


Fig 2.

A, *Spondylus butleri* Reeve, 1856, NM-H357, Conducia Bay, Mozambique, c. 3 m below LST; height 93.3 mm, length 90.1 mm. B, *S. sinensis* Schreibers, 1793, NM-G3049, Conducia Bay, Mozambique, height 67.8 mm, length 67.9 mm. C, D, *S. tenuispinosus* Sowerby, 1847, NM-H175, Conducia Bay, Mozambique, height 53.2 mm, length 55.8 mm. E, F, *S. cuneus* Reeve, 1856, NM-B9978, 1 km S. of Kosi Bay, Zululand, 20 m, height 66.1 mm, length 58.6 mm. Measurements exclude spines.

52 (synonymy), pl. 18, fig. 1A–E. Type locality: “China” (Chemnitz, 1784: 76).

Spondylus regius (non Linnaeus, 1758); Boshoff, 1965: 136.

Diagnosis: Shell height (left) valve, to 75mm; ovate, gibbous.

Sculpture of 5–6 principal ribs, ornamented with strong sparse spines, varying from pointed to spatulate (claw-like), some specimens have long spines while on others they are short and depressed; interstices are wide and have two or three broad ribs which usually bear dense minute spines. Colour variable, mauve-white to bright orange, internally white with a brightly coloured crenulated margin, brown at the hinge. Area of attachment small.

Material examined: Northern Mozambique: 1pv, NM-G3049, Conducia Bay, Mozambique Province, K. Grosch.

Distribution: Indo-West Pacific to northern Mozambique.

Habitat: Lives attached to corals or in coral sand.

Spondylus tenuispinosus Sowerby, 1847

Figure 2 C,D

Spondylus tenuispinosus Sowerby, 1847: 421, sp. 9, pl. 87, fig. 37; Reeve, 1856: pl.6, sp. 23; Fulton, 1915: 337, sp. 37; Lamy, 1938: 198 (references); Lamprell, 1986: 34, pl. 10, fig. 3. Type locality: Isle of Zebu, Philippines.

Diagnosis: Shell height (left) valve, to 35mm; oval, depressed. Sculpture of numerous radial striae and ridges are profusely spined with minute, sharp, erect spines, some longer marginally. Colour: white with circular bands of orange with rose staining; internally white with a variegated coloured crenulated margin. Area of attachment small.

Material examined: Northern Mozambique: 1pv, NM-H175, Conducia Bay, Mozambique Province, K. Grosch, Sept 1975. Southern Mozambique: 1pv, NM-H7415, Maputo, B.J.Young, Aug 1979.

Distribution: Central Indo-West Pacific to southern Mozambique.

Habitat: attached to dead corals.

Spondylus cuneus Reeve, 1856

Figure 2 E,F

Spondylus cuneus Reeve, 1856: pl. 15, sp. 56; Fulton, 1915: 332, sp. 8; Lamprell, 1986: 30 (synonymy), pl. 8, fig. 1a–d. Type locality: West Indies.

Diagnosis: Shell height (left) valve 70mm; oblong ovate. Sculpture of many irregular ridges, ornamented with numerous, regular, strong, slightly depressed, blunt spines of varying lengths; interstices usually smooth but minor spines do occur in some

specimens. Colour purple-red to brown, spines usually of a purple colour, internally white with a purple coloured crenulated margin.

Material examined: Northern Mozambique: 1pv, NM-H353, Conducia Bay, K. Grosch. South Africa: Zululand: 1pv, NM-B9978, 1ml S of Kosi Bay, 0.6ml offshore, 20m, under living coral, ORI, Dec 1984; 1lv, 1pv, NM-D9412, off Kosi Bay, main reef, 1.4km S of estuary, 9–17 m, D. Herbert & NPB, Jul 1987; 1pv, NM-D9369, off Kosi Bay, main reef, 1–2 km S of estuary, outer edge, 18–24 m, dived, D. Herbert & NPB, Jul 1987; 1lv, NM-E2423, Leadsman Shoal, reef off wreck of Tamavo, 20–28 m, dived, D. Herbert & NPB, May 1988.

Distribution: West Indies (Reeve), Central Indo-West Pacific to northern Zululand.

Habitat: On and under live corals in 9–30 m.

Remarks: The type locality of this species (West Indies) is in doubt, as there does not appear to be any recent record of *S. cuneus* from this now well-collected area. At the same time Reeve recorded *S. hystrix* (preocc. *S. hystrix* Röding, 1798) [= *S. cuneus*] from the Philippines (which Fulton unnecessarily renamed *S. reevei*, citing the same locality).

Spondylus sanguineus Dunker, 1852

Figure 3 A

Spondylus sanguineus Dunker, 1852: 55; Dunker, 1858: 26, sp. 22, pl. 7, figs 4–5; Iredale, 1939: 377; Lamprell, 1986: 72 (synonymy), pl. 27, figs 1A–C. Type locality unknown.

Diagnosis: Shell height (left) valve to 30mm; solid, fan-shaped. Sculpture of numerous fine, radial ribs which are ornamented with fine nodular spines, some small spines occur marginally. Colour burnt-brown, orange or white with radial rays of pink, cardinal area with 2 or more brown stripes diverging from under the umbones, internally white, external colour visible internally.

Material examined: South Africa: Zululand: 2pv, NM-B9492, between Bhanga Nek and Kosi Bay, Reef no. 13, drop-off at outer edge, 12–20m, D. G. Herbert & NPB, Jul 1987.

Distribution: Indo-West Pacific to northern Zululand.

Habitat: Lives attached to undersides of coral slabs, lower or right valve totally fixed to substrate.

Spondylus castus Reeve, 1856

Figure 3 B,C

Spondylus castus Reeve, 1856: pl. 13, sp. 47; Fulton, 1915: 334, sp. 19; Lamy, 1938: 273 (references); Lamprell, 1986: 26, pl. 6, fig. 3. Type locality: Philippine Islands.

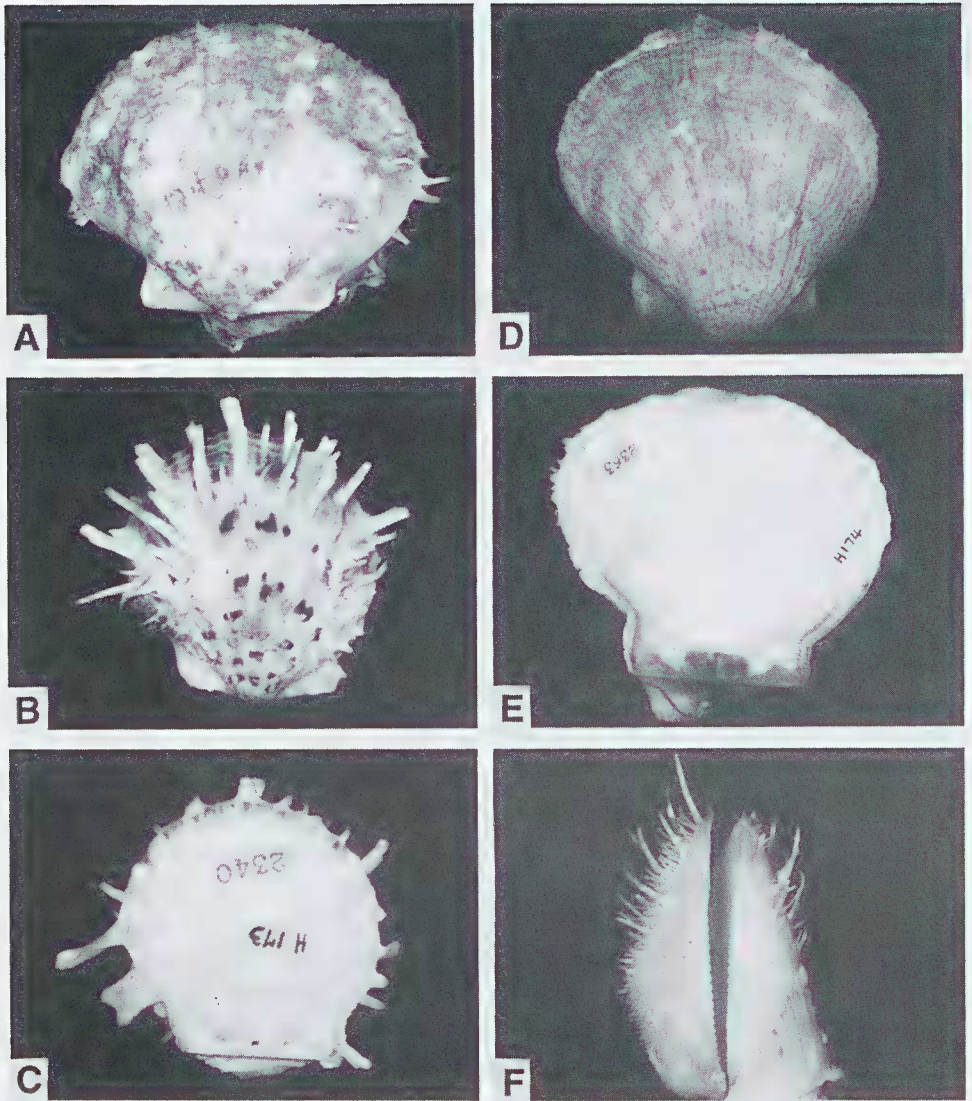


Fig 3. A, *Spondylus sanguineus* Dunker, 1852, NM-D9492, between Bhanga Nek and Kosi Bay, Zululand, 12-20 m, height 44.5 mm, length 52.8 mm. B, C, *S. castus* Reeve, 1856, NM-H173, Conducia Bay, Mozambique, reef, height 44.9 mm, length 46.8 mm. F, *S. occidens* Sowerby, 1903, NM-E3270, off Gypsy Hill, Zululand, 100-125 m, height 29.1 mm, length 30.0 mm. Measurements exclude spines.

Diagnosis: Shell height (left) valve to 50mm; ovate, depressed. Sculpture of numerous radial, striated ribs which are ornamented with long, thin, flat spines, depressed marginally. Colour: white with black spotting at the umbones; internally white, brown or orange at the crenulated margin. Area of attachment large.

Material examined: Northern Mozambique: 1pv, NM-H173, N of Chocas, SW Conducia Bay, Mozambique Province, on rock outside reef, current, some surf, LST level, K. Grosch, Sept 1975.

Distribution: Indo-West Pacific to northern Mozambique.

Habitat: Lives attached to rock or debris.

Spondylus flabellum Reeve, 1856

Figure 3 D,E

Spondylus flabellum Reeve, 1856: pl. 6, sp. 21, pl. 13, sp. 21b; Fulton, 1915: 359, sp. 78; Lamprell, 1986: 70, pl. 26, figs 2A–C. Type locality: unknown.

Diagnosis: Shell height (left) valve to 110mm; broadly triangular, fan-shaped, slightly depressed. Sculpture of numerous irregular ridges, the principal ridges bear short thick spines, sometimes depressed while the spines are often obsolete. Colour varies from purple red to orange with some white areas, umbonally there is a consistent black pattern of vertical lines on a white area; internally white, crenulated margin coloured. Area of attachment large.

Material examined: Northern Mozambique: 1pv, NM-H174, N of Chocas, Conducia Bay, Mozambique Province, washed up from offshore reef during cyclone, K. Grosch, Sept 1975. South Africa: Zululand: 1pv, NM-B1644, Cape Vidal, B.J. Young, Aug 1979.

Distribution: Indo-West Pacific to Zululand.

Habitat: Lives attached to corals and in loose coral sand.

Spondylus occidentis Sowerby, 1903

Figure 3 F; 4 A,B

Spondylus occidentis Sowerby, 1903: 77, pl. 5, fig. 9; Fulton, 1915: 359, sp. 77; Lamprell, 1986: 36, pl. 11, figs 1A–B. Type locality: Philippines.

Diagnosis: Shell height (left) valve to 70mm; ovate, slightly gibbose. Sculpture of numerous ridges which bear fine, sharp, upright spines with five or six rows bearing slightly longer spines. Colour white with rays of orange or pink from the umbo to the margin. Internally white, with orange and white variegated crenulated margin. Area of attachment moderately large.

Material examined: South Africa: Northern Zululand: 1pv, NM-D8811, off Jesser Point (27°32.6'S; 32°43.3'E), 150m, sandstone rubble, NMDP, 9 Jun 1987; 1pv, 2lv, NM-E3270, off Gypsy Hill (27°48.7'S; 32°39.4'E), 100–125m, amongst broken shell, NMDP, 11 Jun 1988; 1lv, NM-E4069, NE of Liefeldt's Rocks (27°42.9'S; 32°40.9'E) 160m, broken shell, NMDP, 8 May 1988; NM-E4069, off Gobey's Point (27°26.2'S; 32°44.7'E), 120–150m, sandstone rubble, glass sponges, NMDP, 8 May 1988. South Africa: Southern Natal: 1lv, NM-B3943, off Park Rynie, 140m, sponge & rubble, NMDP, Mar 1981; 1lv, NM-B3565, off Park Rynie, 110–130m, eroded shell & conglomerate, NMDP, Mar 1981; 1lv, NM-B3867, off Park Rynie, 140m, sponge rubble, NMDP, Mar 1981; 1lv, 1rv, NM-B3820, dredged off Park Rynie, 120m, rubble

& solitary rubble, NMDP, Mar 1981; 1lv, NM-C1705, dredged off Park Rynie (30°22.8'S; 30°50.5'E), 104m, fine sand, NMDP, 19 Aug 1981; 1rv, NM-C1672, dredged off Park Rynie (30°22.6'S; 30°50.0'E), 124m, some sand, NMDP, 19 Aug 1981; 1lv, NM-D716, off Umlaas Canal (29°58.5'S; 31°00.8'E), 75m, muddy sand, NMDP, 10 Jul 1985. South Africa: Transkei: 1lv, NM-C1203, off Port Grosvenor (39°57.9'S; 31°25.9'E), 120–128m, coarse sand, some mud, solitary coral and shells, NMDP, Aug 1981. Extralimital: 1pv, NM-K2160, Reunion Is., Mascarenes, Cap la Houssaye, 12m in coral holes, J.Drivas, Aug 1987.

Distribution: Indo-Pacific to eastern Transkei.

Habitat: Attached to corals and rocks in deep water (55–150m); only juveniles were dredged in living condition during the NMDP.

Spondylus nicobaricus Schreibers, 1793

Figure 4 C–F

Spondylus nicobaricus Schreibers, 1793: 154 (based on Chemnitz, 1784: pl. 45, fig. 469); Sowerby, 1897: 28; Braga, 1952: 97; Paes da Franca, 1960: 91, pl. 22, fig. 3; Lamprell, 1986: 28 (synonymy), pl. 7, figs 1 A–C. Type locality: Nicobar Islands (Chemnitz, 1784).

Spondylus hystrix Röding, 1798: 195 (cites Chemnitz, 1784: pl. 45, fig. 470); Barnard, 1964: 434; Boshoff, 1965: 137, pl. 3, fig. 2 [in part only]. Type locality unknown [= Nicobar Islands (Chemnitz, 1784)].

Spondylus igneus Fulton, 1915: 354, sp. 51.

Spondylus sp.?: Turton, 1932: 234, pl. 61, no. 1636.

Diagnosis: Shell height (left) valve to 70mm; ovate to elongate-ovate. Sculpture of numerous ridges which bear dense, short, usually sharp, upright or slightly depressed spines; interstices usually with one or two rows of smaller serrated spines. Colour variable, usually white with blotches of black, purple or red, often in radial rays; external colour visible internally. Area of attachment large.

Material examined: Northern Mozambique: 1pv, NM-H361–362, NE Conducia Bay, NE Isla Quissirwa, on rock near small coral area, current, 600mm above LST, K. Grosch, Jan 1963; 1pv, NM-H183, Conducia Bay, Isla Chaca, south shore, under encrusted rock on reef, surf, current, 600mm above LST, K. Grosch, Nov 1967; 1pv, NM-H179, Conducia Bay, Memba Bay, SW of Ponta Nangata, underside encrusted rock slab in reef, LST, K. Grosch, Sept 1963; 1pv, NM-H366, SE Memba Bay, Baixo do Pinda Strait, coral slab on reef, 300mm above LST, K. Grosch, Jan 1969; 1pv, NM-H187, 3pv, NM-H188; 1pv, NM-H365, Conducia Bay, Mocambique Province, K. Grosch, Sept 1975; 1pv, NM-H184, SE Nacala Bay, Fernao Velosa, Mocambique Province, under rock slab in reef, some surf, 600mm above LST, K. Grosch, Nov 1969; 1pv, NM-H180, SW Conducia Bay, N of Chocas, under rock slab on rocky reef offshore, LST, K. Grosch, Mar 1955; 1pv, NM-H360, SW Conducia Bay, N of Chocas, current, some surf, 300mm above LST, K. Grosch, Mar 1956; 1pv, NM-H186, SW

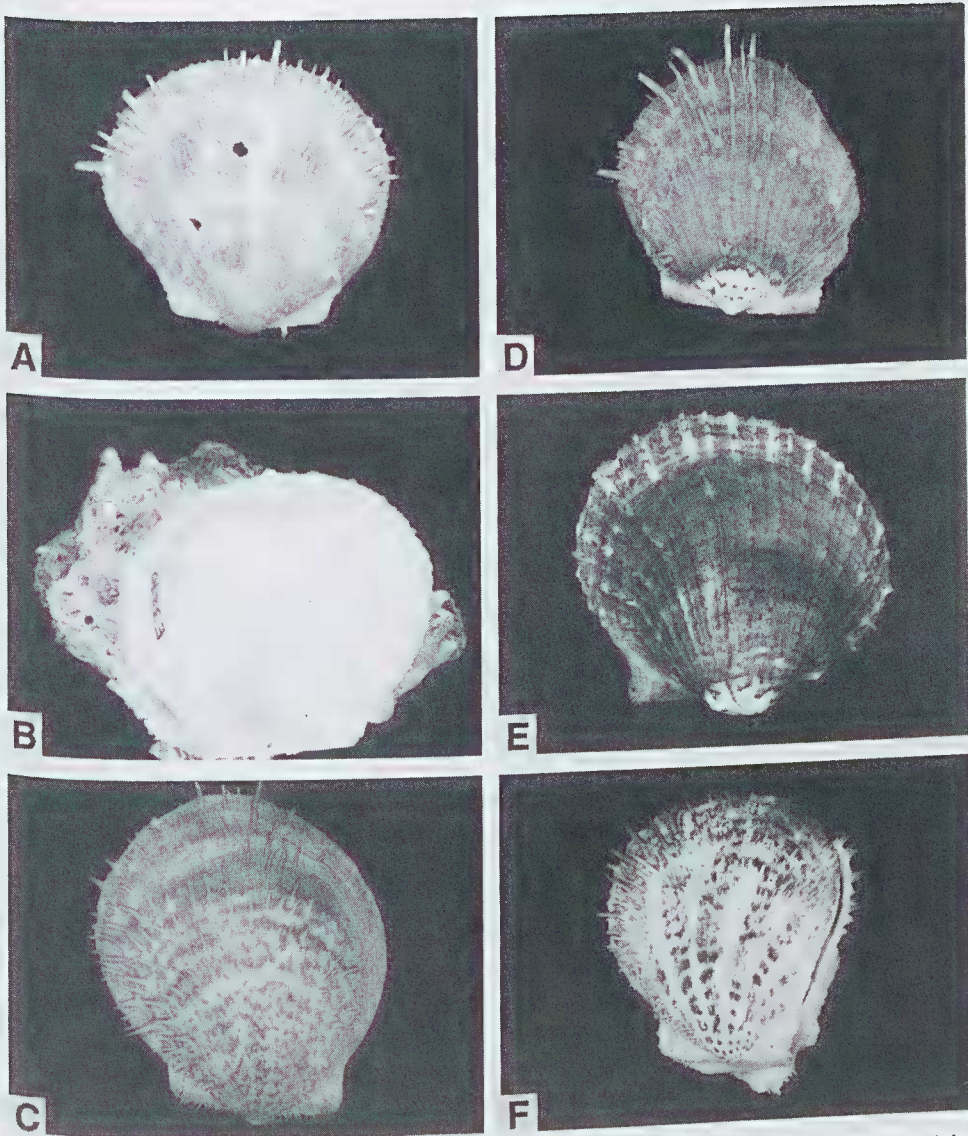


Fig 4. A,B, *S. occidens* Sowerby, 1903, NM-E3270, off Gypsy Hill, Zululand, 100-125 m. height 29.1 mm, length 30.0 mm. C-F, *S. nicobaricus* Schreibers, 1793: C, NM-2404, Durban, Natal, height 61.4 mm, length 55.3 mm; D, NM-9412, off Kosi Bay, Zululand, 9-17 m, height 41.7 mm, length 37.7 mm; E, NM-H364, Mozambique Bay, 1 m below LST, height 32.7 mm, length 34.9 mm; F, NM-J5106, Bazaruto Is, Mozambique, height 40.3 mm, length 38.0 mm. Measurements exclude spines.

Conducia Bay, N of Chocas, side of encrusted rock in reef, 300mm below LST, K.Grosch, Sept 1958; 3pv, NM-H176 & H365, Conducia Bay, K. Grosch; 1pv, NM-H356, SW Conducia Bay, NW of Chocas, under rock in coral area, current, some surf, 600mm below LST, K. Grosch, Oct 1969; 1pv, NM-H178, SW Conducia Bay, NW of Chocas, rock inshore, *Thalassodendron* and gravel, K. Grosch, Mar 1968; 1pv, NM-H181, Conducia Bay, N of Inhaca Grande, under rock in tidal pool, current, 600mm

above LST, K. Grosch, Nov 1967; 1pv, NM-H364, SE Mozambique Bay, W Banco de Sancul, sandy area amongst *Thalassodendron*, little surf, 900mm below LST, K. Grosch, Nov 1968; 1pv, NM-H363, SE Lunga Bay, off Quieirua, under rock slab in rocky/*Thalassodendron* area, 300mm above LST, K. Grosch, Aug 1968; 1pv, NM-H185, SE Lunga Bay, off Quieirua, under side of boulder on reef, some surf, LST, K. Grosch, Apr 1968; 1pv, NM-H182, Lunga Bay, SE Ponta Calajulo, on dead coral, some surf, current, LST, K. Grosch, Oct 1967; 1pv, NM-H355, SE Lunga Bay, Calajulo, K. Grosch, Dec 1974; 1pv, NM-H359, SE Memba Bay, W of Nangata, under rock in gravel, next to reef, surf, current, LST, K. Grosch, Mar 1949; 1pv, NM-H177, Mozambique Bay, S Isla de Sena, under rock slab on reef, some surf, LST, K. Grosch, Nov 1968; 1pv, NM-J9402, Quirimba Arch, NW Quisiva Is, R. Kilburn, 27 Sept 1984. Southern Mozambique: 1pv, NM-G3163, Bazaruto Archipelago, Santa Carolina Is., W coral reef, R. Kilburn, Aug 1974; 2pv, NM-J5107, sandbanks W of central Bazaruto Is., amongst oysters and *Thalassodendron*, LST, E. Roscoe, May 1975; 1pv, NM-J5105, West Bay, Santa Carolina, E. Roscoe, 5 Nov 1975; 5pv, NM-J5106, N Reef, Bazaruto Is, E. Roscoe, Jan 1972; 4pv, 1rv, 7lv, NM-4501, Inhaca Is., Bay of Maputo, P. Boshoff. South Africa: Zululand: 1pv, NM-4502, Kosi Bay, F. Toppin, Mar 1906; 1pv, NM-D9493, between Kosi Bay and Bhanga Nek, No 13 Reef, drop-off at outer edge, 12–20m, D. Herbert & NPB, Jul 1987; 4lv, NM-4605, Bhanga Nek, O. Bourquin, Jan 1965; 6pv, 2lv, NM-D5196, Sodwana Bay, Two-mile Reef, 10–15m, D. Herbert, Oct 1986; 1pv, 2lv, NM-D5263, Sodwana Bay, Nine-mile Reef, 6–15m, D. Herbert, Oct 1986; 3pv, 4lv, NM-D5562, Mission Rocks, intertidal, R. Kilburn, D. Herbert, 24–30 Apr 1987. South Africa: Natal: 25pv, NM-A190, Salt Rock, Umhlali district, among and inside oysters on side of swimming bath, 300–600mm, R. Kilburn, Mar 1973; 1pv, NM-A5679, Thompson's Bay, Umhlali, tidal swimming pool, R. Kilburn, Jan 1976; 6pv, 3lv, NM-4499, Durban, W. Falcon; 6pv, NM-2401–02, NM-2404–05, NM-2860, Durban, H. Burnup; 2pv, NM-B1659, NM-1658, Vetch's Pier, Durban, B.J. Young, Aug 1973 & Mar 1974; 1pv, NM-E8493, Treasure Beach, N of Reunion Rocks, under rock in large tidal pool, T. Stewart, Aug 1989; 1pv, NM-A3717, Reunion Rocks, N of Isipingo, R. Cock, 1965; 2pv, NM-8073, Isipingo, in tidal swimming pool, R. Kilburn; 1pv, NM-A2973, Mtwalume, rock pools, R. Kilburn, Jun 1972; 1pv, NM-D2580, T. O. Strand, 2km N of Port Edward, R. Kilburn & D. Herbert, May 1986. South Africa: Transkei: 2pv, NM-C8377, Mbotyi, D. Herbert & R. Kilburn, Jun 1985; 1lv, NM-B7018, Coffee Bay, W. Tyson; 1pv, NM-E6021, between Mzamba & Mtentu Rivers, J. Stannard, Jul 1988; 1lv, NM-B4960, Msikaba, among LT rocks on island, R. Kilburn, 10 Feb 1978. South Africa: Eastern Cape Province: 2lv, NM-D4657, Port Alfred, ex Albany Mus, J. Hutt colln 1980.

Distribution: Tropical Indo-West Pacific to Transkei, with an occasional juvenile settling as far south as the eastern Cape Province (Port Alfred).

Habitat: Under rocks and inside empty oyster shells in low tide pools and down to about 20m.

Remarks: *Spondylus nicobaricus* is the commonest member of the genus in south-eastern Africa. It is extremely variable in sculpture and colouration; whereas tropical Indo-Pacific specimens are predominantly either all-white, white with dark spotting at the umbo or white with radial purple-red rays (= form *radians*), south-east African

specimens include the *radians* form, but vary in colour to deep purple-red with white umbonal area and purple-red spotting, with dark internal margins. In addition, younger specimens usually have long, thin, slightly recurved spines, with some similar but slightly shorter spines in the interstitial areas. *Spondylus igneus* Fulton, 1915 from Mauritius, cannot be separated from the dark coloured specimens of *S. nicobaricus* examined during this study and must be relegated to synonymy with that species. Boshoff (1965) ascribed extremely wide sculptural variation to this species, but his photographs show a mixture of *S. nicobaricus* and *S. groschi*. The single juvenile valve (diameter 6mm) recorded from Port Alfred by Turton (1932) is referable here, according to his photograph.

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